UCRL-JC-124376 Abs

Component Development for the NIF Power Conditioning System

M. Newton, D. Larson, G. Ullery, S. Hulsey, P. Test
Lawrence Livermore National Laboratories (LLNL)
M. Wilson, C. Harjes
Sandia National Laboratories (SNL)
B. Anderson
American Controls Engineering
Tel: (510) 422-1861, FAX: (510) 422-7781, e-mail: newton6@llnl.gov

"Poster presentation preferred"

The National Ignition Facility (NIF) is a high energy glass laser system and target chamber that will be used for research in inertial confinement fusion. The NIF laser system is comprised of 192 beams pumped by over 8600 Xenon flashlamps. The power conditioning system for NIF must deliver nearly 300 MJ of energy to the flashlamps in a cost effective and reliable manner for at least 20,000 shots. Due to its enormous size, it is imperative that the cost of the power conditioning system be reduced significantly compared to past laser systems such as NOVA and Beamlet. A power conditioning system architecture has been chosen for NIF that should significantly reduce the power conditioning system cost but substantial development is required to simultaneously achieve the cost and performance goals.

The power conditioning system is a modular system of capacitive energy storage modules that store approximately 1.6 MJ each and deliver that energy through a single switch assembly to 20 parallel sets of flashlamps with each set having two flashlamps in series. The present system design has over 200 modules. The cost and reliability of each component is extremely important because of the system's size. Each component of the power conditioning system must be carefully optimized to minimize cost, yet insure reliability and adequate performance under normal operating conditions. In addition, system fault modes place extraordinary demands on many of the system's components. Components are being developed that will either survive system faults where possible or be easily replaceable.

Our development program is focused on achieving aggressive cost and/or performance goals for each component in the system and demonstrating reliable system operation. We presently have ongoing activities at LLNL, SNL and American Controls Engineering to develop components and validate system operation. In this paper, we will discuss our design goals and development program progress for the system and components. The description of the current development status will include recent test results and a discussion of their implications on the present design of the power conditioning system.

Work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under contract No. W-7405-Eng-48.